SECTION 5
Row Crop Management Issues

5.1 IDENTIFYING PROBLEMS

5.1.1 What Was Already Known:

Before members of the Watershed Initiative began researching agricultural issues in the watershed, it was generally known that row crops, primarily corn and soybeans, are less prevalent in the Morgan County White River watershed when compared to other areas of Morgan County. This fact is primarily due to the steep slopes that dominate the landscape in the watershed. The row crop acres that do exist in the watershed, as depicted in Figure 5-1, are concentrated in three primary areas:

1.) the White River bottoms
2.) the Lambs Creek, Sycamore Creek, and Highland Creek bottoms
3.) the northwestern boundary of the watershed, near Monrovia, which is flat to gently rolling.

The local SWCD, NRCS and IDNR staff members were aware that agricultural conservation practices are not widely adopted throughout the watershed. They realized that a watershed plan was necessary to identify and prioritize the conservation needs and develop a strategy to increase the utilization of agricultural best management practices such as:

- conservation tillage
- conservation buffers
- nutrient management
- pesticide management

The local SWCD, NRCS, and IDNR staff were also aware of the fact that many of the agricultural acres in the northwest portion of the watershed, near Monrovia, are decreasing annually due to the level of development occurring in the area. With the anticipation of selling land that is increasing in value, many landowners in areas experiencing urban sprawl are reluctant to commit the time or money to implement conservation practices.

5.1.2 What Was Learned During the Process

The watershed coordination team, with the assistance of the Land Use and Technical Committees, conducted an agricultural assessment of the watershed. The assessment included the utilization of existing and current water quality data, available GIS data, field surveys, personal conversations with local agricultural professionals, and review of Indiana agricultural statistics, and other available agricultural data. The purpose of the assessment was to identify the impact that row crop production has on water quality, the current conservation trends in the watershed, and the particular conservation practices necessary to mitigate any water quality pollution that may be occurring as a result of certain agricultural practices. This information is discussed throughout this section.

Through various conversations with farmers at the Morgan County Fair, several public stakeholder meetings, and most notably, the Agricultural Stakeholder Meeting conducted on February 5, 2003, the following information was also learned:

1.) *Local farmers are not completely aware of their options when it comes to conservation practices and available conservation programs.*
2.) *Local farmers are concerned that increased participation in voluntary conservation programs may potentially lead to more regulation.*
3.) *Local farmers are receptive and willing to participate in conservation programs but feel they need more information on the requirements associated with participating in such activities.*
4.) *Local farmers need the assurance that long-term support for such programs will be available.*

5.1.2.1 Water Quality

To assess water quality in the Morgan County White River watershed, the coordination team relied on two sources of water quality data:

Table 5.1: Land Use in Acres

Land Use in Acres							
	West Central Morgan County White River Watershed	Sycamore Creek	Lambs Creek-Patton Lake	Lambs Creek-Goose Creek	Highland Creek	White River Centerton	White River Martinsville
Pasture	7,049	2,718	1,270	1,558	542	337	624
Row Crops	10,232	2,218	1,875	996	189	1,319	3,635
*Deciduous Forest***	31,693	6,570	6,254	8,432	4,345	2,184	3,942
Conifer Forest	119	36	27	7	4.3	30	15
Open Water	756	142	95	27	1.0	91	400
Urban High Density	207	14	0	0	0	10	183
Urban Impervious	309	33	44	0	0	105	127
Urban Low Density	567	99	0	0	.5	29	438
Wetland***	1,492	138	104	107	42	395	706
Total Acres	52,438	11,968	9,669	11,127	5,124	4,480	10,070
** Includes mixed forest, shrubland, woodland *** Includes several wetland types							

1.) water quality data collected and analyzed by the IDEM, the primary agency involved in surface water quality monitoring and assessment in the State of Indiana.
2.) water quality data collected by the watershed coordination team throughout the planning phase of this project.

Data collection identified periodic spikes of phosphorus and nitrogen in the northern portions (where there is a greater concentration of agricultural land) of the Sycamore Creek subwatershed.

Also, field data shows high nitrogen and phosphorous levels in the lower portion of Lambs Creek.

Specific testing for pesticides or herbicides was not completed as part of this project. Water quality data can be found in detail in Appendix B of this document. A summary of conclusions from data is provided on page B-21.

5.1.2.2 Land Use

Utilizing GAP Data, it was determined that approximately 20% or 10,487 acres of the Morgan County White River watershed are utilized for row crop production (See Table 5-1). As mentioned above, the majority of those acres lie within the creek and river bottoms and in the northwest portion of the watershed (see Figure 5-1) and the White River floodplain.

5.1.2.3 Highly Erodible Lands (HEL)

It was also learned that approximately 6,264 acres (61%) of the row crop acres within the watershed are comprised of soils considered to be highly erodible lands (HEL). There are nineteen (19) different soil series found in the watershed that are considered, according to the Morgan County soil survey, to be highly erodible (see Table 5-2). The majority of the HEL acres involved in row crop production are located in the northwestern portion of the watershed (see Figure 5-2).

Table 5.2: Highly Erodible Lands (HEL)
in the Morgan County White River Watershed

Symbol	Soil Series	Tolerable Soil Loss (Tons/Year)
AfC2	Alford	5
AvB	Ava	4
BeB	Bedford	4
BeC2	Bedford	4
BfG	Berks	3
ChF	Chetwynd	5
CnC2	Cincinnati	4
CnC3	Cincinnati	2
CnD2	Cincinnati	4
CnD3	Cincinnati	2
EsC2	Elkinsville	5
FxC2	Fox	4
GpC	Gilpin	3
GpD	Gilpin	3
GpE	Gilpin	3
GrC	Grayford	5
GrD2	Grayford	5
HkF	Hickory	5
MbD2	Markland	3
MbE	Markland	3
MnB2	Miami	4
MnC2	Miami	4
MnD2	Miami	4
MnE	Miami	4
MnF	Miami	4
MoC3	Miami	3
MoD3	Miami	3
PkC2	Parke	5
PkD	Parke	5
PnB	Pekin	4
PrD	Princeton	5
PrE	Princeton	5
WcG	Weikert	1
WfC	Wellson	4
ZaB	Zanesville	4
ZaC	Zanesville	4

Figure 5.1: Watershed-Subwatershed Gap Data

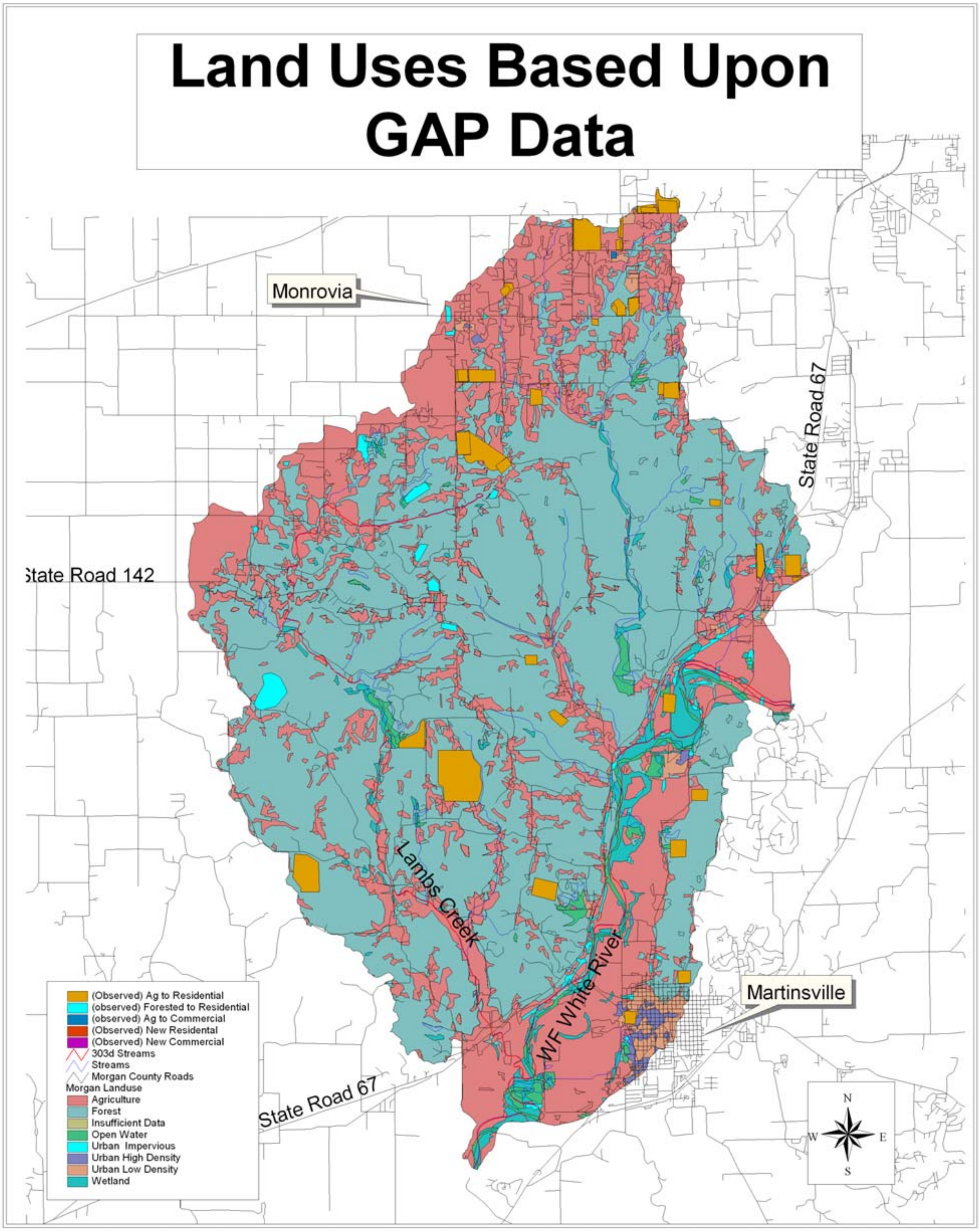
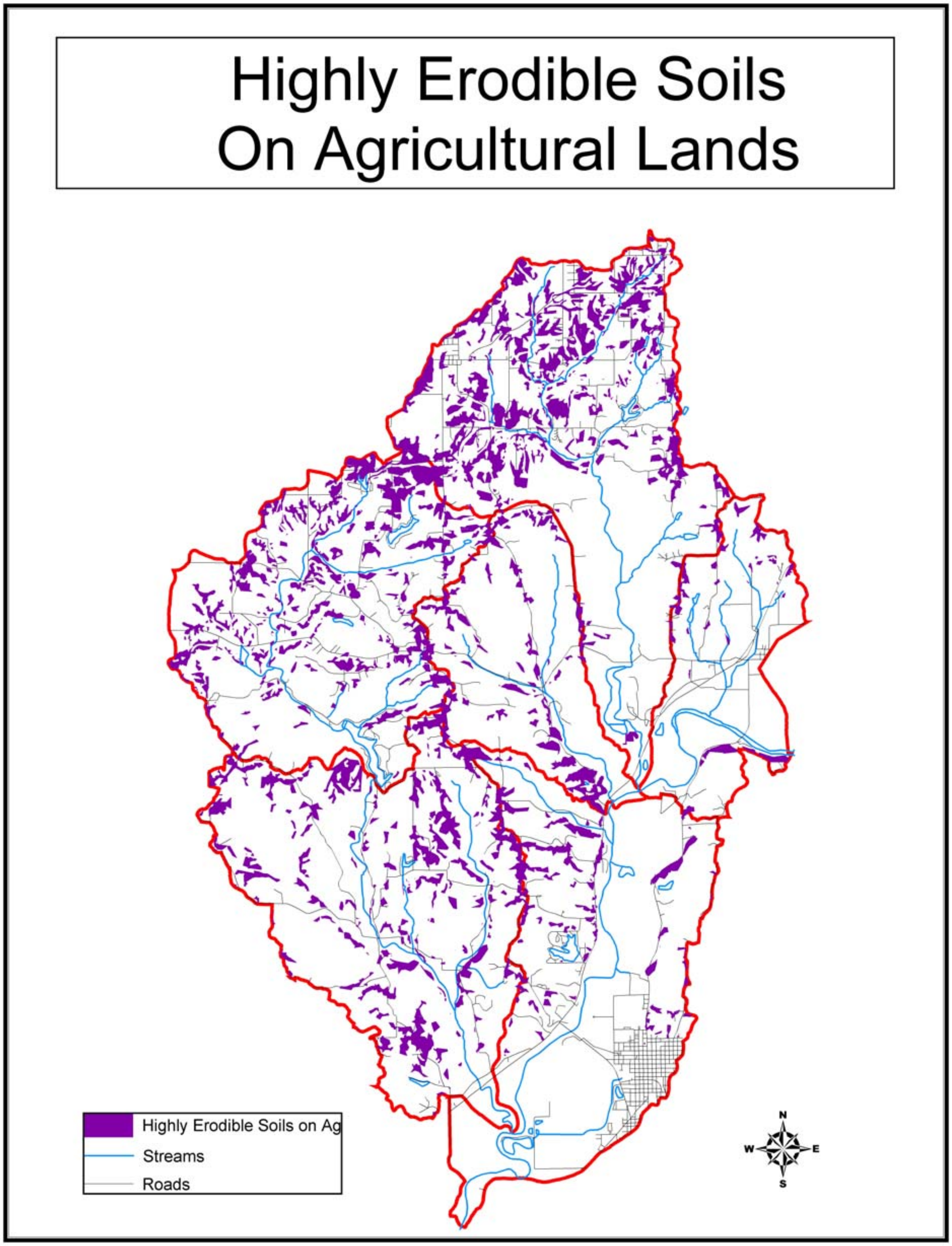


Figure 5.2: Highly Erodible Soils on Agricultural Lands



5.1.3 Causes or Probable Causes of Impairments and Threats to Water Quality

Despite the small percentage of land involved in row crop production, some agricultural practices were identified as a possible cause or threat of impairment (see Section 1) to the White River watershed.

Generally speaking, agriculture has been identified as one of the major contributors of nonpoint source pollution in rural landscapes around the United States. In 1997, the National Water Quality Inventory (NWQI), sponsored by the United States Environmental Protection Agency (US EPA), reported that agricultural nonpoint source (NPS) pollution is the leading source of water quality impacts to surveyed rivers and lakes, the third largest source of impairments to surveyed estuaries, and a major contributor to ground water contamination and wetlands degradation. (EPA, 1997).

Probable NPS pollutants stemming from agriculture in the White River watershed include nutrients, pesticides, and sediment (see Table 5-3). Such pollutants can migrate from agricultural lands to surface and groundwater through processes including surface runoff, erosion, infiltration and drainage tile outlet. It is important to note, however, that pesticides and fertilizers can pose a threat to surface and ground water quality not only during the application phase, but during the transport, handling, and storage phases as well. Also, these pollutants are not specific to agriculture and can originate from urban, commercial, and industrial lands.

Table 5.3: NPS and Row Crop Production

Pollutants	Agriculture Sources
Nutrients	commercial fertilizers and manure
Pesticides	herbicides, insecticides, fungicides
Sediment	sheet, rill, gully, and stream bank erosion

5..1.3.1 Nutrients

Nutrients such as phosphorus (P) and nitrogen (N) in the form of commercial fertilizers, manure, sludge, legumes, and crop residues are applied to enhance crop production. In small amounts, N and P are beneficial to aquatic life, however, too much P and N can stimulate the occurrence of algal blooms and excessive plant growth in receiving waters. Algal blooms and excessive plant growth often reduce the dissolved oxygen content of surface waters through plant respiration and decomposition of dead algae and other plants. This situation can be accelerated in hot weather and low flow conditions because of the reduced capacity of the water to retain dissolved oxygen. Since fish and aquatic insects need the oxygen that is dissolved in water to live, and when decaying algae uses up that oxygen, fish kills can result.

Figure 5.3: Ammonia/Nitrogen Application

5..1.3.2 Pesticides

Pesticides include a broad array of chemicals used to control plant growth (herbicides), insects (insecticides), and fungi (fungicides). These chemicals have the potential to enter and contaminate water through direct application, runoff, wind transport, and atmospheric deposition. They can kill fish and wildlife, contaminate food and drinking water sources, and destroy the habitat that animals use for protective cover.

While some pesticides undergo biological degradation by soil and water bacteria, others are very resistant to degradation.

Such non-biodegradable compounds may become "fixed" or bound to clay particles and organic matter in the soil, making them less available. However, many pesticides are not permanently fixed by the soil. Instead, they collect on plant surfaces and enter the food chain, eventually accumulating in wildlife such as fish and birds. Many pesticides have been found to negatively affect both humans and wildlife by damaging the nervous, endocrine, and reproductive systems or causing cancer (Kormondy 1996).

Figure 5-4: Pesticide Application

5.1.3.3 Erosion and Sedimentation

Sedimentation occurs when wind or water runoff carries soil particles from an area, such as a farm field or stream bank, and transports them to a water body, such as a stream or lake. Excessive sedimentation clouds the water, which reduces the amount of sunlight reaching aquatic plants; covers fish spawning areas and food supplies; and clogs the gills of fish. In addition, other pollutants like phosphorus, pathogens, and heavy metals are often attached to the soil particles and wind up in the water bodies with the sediment.

Figure 5-5: Sheet Erosion

5.1.4 Sources or Probable Sources of Pollutants or Conditions Causing Water Quality Impairments

The sources or probable sources of pollutants or conditions causing water quality impairments or potentially causing water quality impairments include:

- sheet, rill, gully, and stream bank erosion from agricultural fields and streambanks;
- fertilizer and manure application, runoff, and infiltration from agricultural fields, storage barns, mixing pads, etc.;
- pesticide application, runoff, and infiltration from agricultural fields, storage barns, and mixing pads, etc.

5.2 GOALS AND DECISIONS

Solutions for addressing Sources or Probable Source of Pollutants

The identified sources of pollution stemming from row crop production are not specific to the White River watershed or Morgan County. These issues arise with all farming operation around the nation. A remedy to minimize the pollution risks associated with row crop production is through proper management of soils, nutrients, and pesticides. According to agricultural experts, including local SWCD, NRCS, and IDNR staff, as well as national organizations such as the Conservation Tillage Information Center (CTIC), the adoption of a Core 4 program can alleviate the impacts of row crop production. The Core 4 include:

1. conservation tillage
2. conservation buffers
3. nutrient management
4. pesticide management

Conservation Tillage

As defined by the Conservation Tillage Information Center (CTIC), conservation tillage is any tillage and planting system that covers 30 percent or more of the soil surface with crop residue, after planting, to reduce soil erosion by water and wind.

Figure 5.6: Conservation Tillage

No-till, the ultimate form of conservation tillage, is defined by CTIC as the ideal tillage practice to reduce soil erosion by water and wind. In a no-till system, soil is left undisturbed from harvest to planting. Planting or drilling is accomplished using disc openers, coulter(s), row cleaners, in-row chisels or roto-tillers. Weed control is accomplished primarily with crop protection products. Cultivation may be used for emergency weed control.

Benefits of Conservation Tillage
According to the CTIC, there are numerous economic and environmental benefits that conservation tillage offers that conventional tillage systems can't match. The top ten benefits, as identified by the CTIC, are as follows:

1.) Reduces labor, saves time
As little as one trip for planting compared to two or more tillage operations means fewer hours on a tractor and fewer labor hours to pay ... or more acres to farm. For instance, on 500 acres the time savings can be as much as 225 hours per year. That's almost four 60-hour weeks.

2.) Saves fuel
Save an average 3.5 gallons an acre or 1,750 gallons on a 500-acre farm.

3.) Reduces machinery wear
Fewer trips save an estimated $5 per acre on machinery wear and maintenance costs—a $2,500 savings on a 500-acre farm.

4.) Improves soil tilth
A continuous no-till system increases soil particle aggregation (small soil clumps) making it easier for plants to establish roots. Improved soil tilth also can minimize compaction. Of course, reducing trips across the field also reduces compaction.

5.) Increases organic matter
The latest research shows the more soil is tilled, the more carbon is released to the air and the less carbon is available to build organic matter for future crops. In fact, carbon accounts for about half of organic matter.

6.) Traps soil moisture to improve water availability
Keeping crop residue on the surface traps water in the soil by providing shade. The shade reduces water evaporation. In addition, residue acts as tiny dams slowing runoff and increasing the opportunity for water to soak into the soil. Another way infiltration increases is by the channels (macropores) created by earthworms and old plant roots. In fact, continuous no-till can result in as much as two additional inches of water available to plants in late summer.

7.) Reduces soil erosion
Crop residues on the soil surface reduce erosion by water and wind. Depending on the amount of residues present, soil erosion can be reduced by up to 90% compared to an unprotected, intensively tilled field.

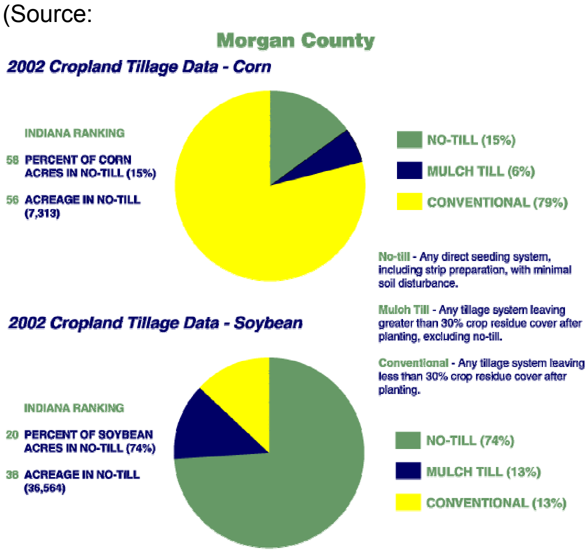
8.) Improves water quality
Crop residue helps hold soil along with associated nutrients (particularly phosphorous) and pesticides on the field to reduce runoff into surface water. In fact, residue can cut herbicide runoff rates in half. Additionally, microbes that live in carbon-rich soils quickly degrade pesticides and utilize

nutrients to protect groundwater quality.

9.) Increases wildlife
Crop residues provide shelter and food for wildlife, such as game birds and small animals.

10.) Improves air quality
Crop residue left on the surface improves air quality because it: Reduces wind erosion, thus it reduces the amount of dust in the air; Reduces fossil fuel emissions from tractors by making fewer trips across the field; and Reduces the release of carbon dioxide into the atmosphere by tying up more carbon in organic matter.

Figure 5.7: Morgan County Tillage Data (Source:



Conservation Buffers

Conservation buffers are small areas or strips of land in permanent vegetation, designed to slow water runoff, provide shelter and stabilize riparian areas. Strategically placed buffer strips in the agricultural landscape can effectively mitigate the movement of sediment, nutrients, and pesticides within farm fields and from farm fields. Buffers include: contour buffer strips, field borders, filter strips, grassed waterways, living snow fences, riparian buffers, shelterbelts/windbreaks, (grass, shrubs and trees), and wetlands. The small amount of land taken out of production helps producers meet environmental and economic goals.

Figure 5.8: Conservation Buffer

Benefits of Conservation Buffers

The economic and environmental benefits of conservation buffers, as identified by the CTIC, are as follows**:**

- Reduce up to 80% of sediment from runoff.
- Reduces 40% (on average) of phosphorous from runoff.
- Removes a significant amount of nitrate from runoff.
- Reduces up to 60% of pathogens removed from runoff.
- Provides a source of food, nesting cover and shelter for wildlife.
- Improves fish habitat.
- Reduces wind erosion.
- Slows water runoff.
- Reduces downstream flooding.
- Stabilizes streambanks.
- Establish natural vegetation.
- Adds visual aesthetics to the landscape.
- Protects soil in vulnerable areas.

Riparian Buffer Width Requirements

According to the Natural Resource Conservation Service (NRCS), riparian buffer width depends on both the character and the needs of the site. Below are the ideal buffer widths for addressing a variety of issues according to the NRCS.

Stabilize eroding banks - On smaller streams and lakes, good erosion control may require only the width of the bank to be covered with shrubs and trees. Extending buffer vegetation beyond the bank is necessary where more active bank erosion is occurring.

Filter sediment and sediment-attached contaminants from runoff - For slopes less than 15%, most sediment settling occurs within a 25-30 ft (8-9.25 m) wide buffer of grass. Greater width may be required for shrub and tree vegetation, on steeper slopes, or where sediment loads are particularly high.

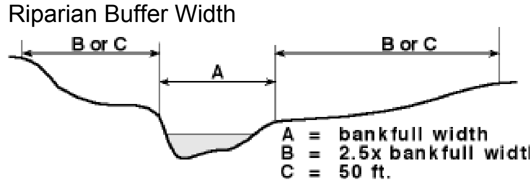
Filter soluble nutrients and pesticides from runoff - Width up to 100 ft (30 m) or more may be necessary on steeper slopes and less-permeable soils to obtain sufficient capacity for infiltration of runoff, and vegetation and microbial uptake of nutrients and pesticides.

Provide shade, shelter, and food for aquatic organisms - Warm water fisheries may require only very narrow buffers, except where shade and temperature control is needed to discourage algae blooms. Width up to 100 ft (30 m) in trees may be needed for adequate shade and water temperature control for cold-water fisheries in warmer climates.

Wildlife habitat - Width required is highly dependent upon desired species. For example, Nebraska NRCS Standards call for a minimum of 45 ft (14 m) of grass to promote upland game birds. Generally, larger animals have greater minimum width requirements, particularly interior forest species. Narrower width may be acceptable where a travel corridor is desired for connecting larger areas of habitat.

NRCS recognizes that it is not always feasible, for numerous reasons, to construct buffer strips as wide as what is suggested in the above paragraphs. For this reason, the NRCS has developed a minimum standard for assessing the buffering needs of a stream. The standard is based on a dimension equal to two and one-half times the bankfull channel width or 50 feet, whichever is less (See Figure 5-9). This distance is measured away from the bankfull channel to arrive at the standard buffer width.

Figure 5.9: NRCS Formula for Establishing Riparian Buffer Width

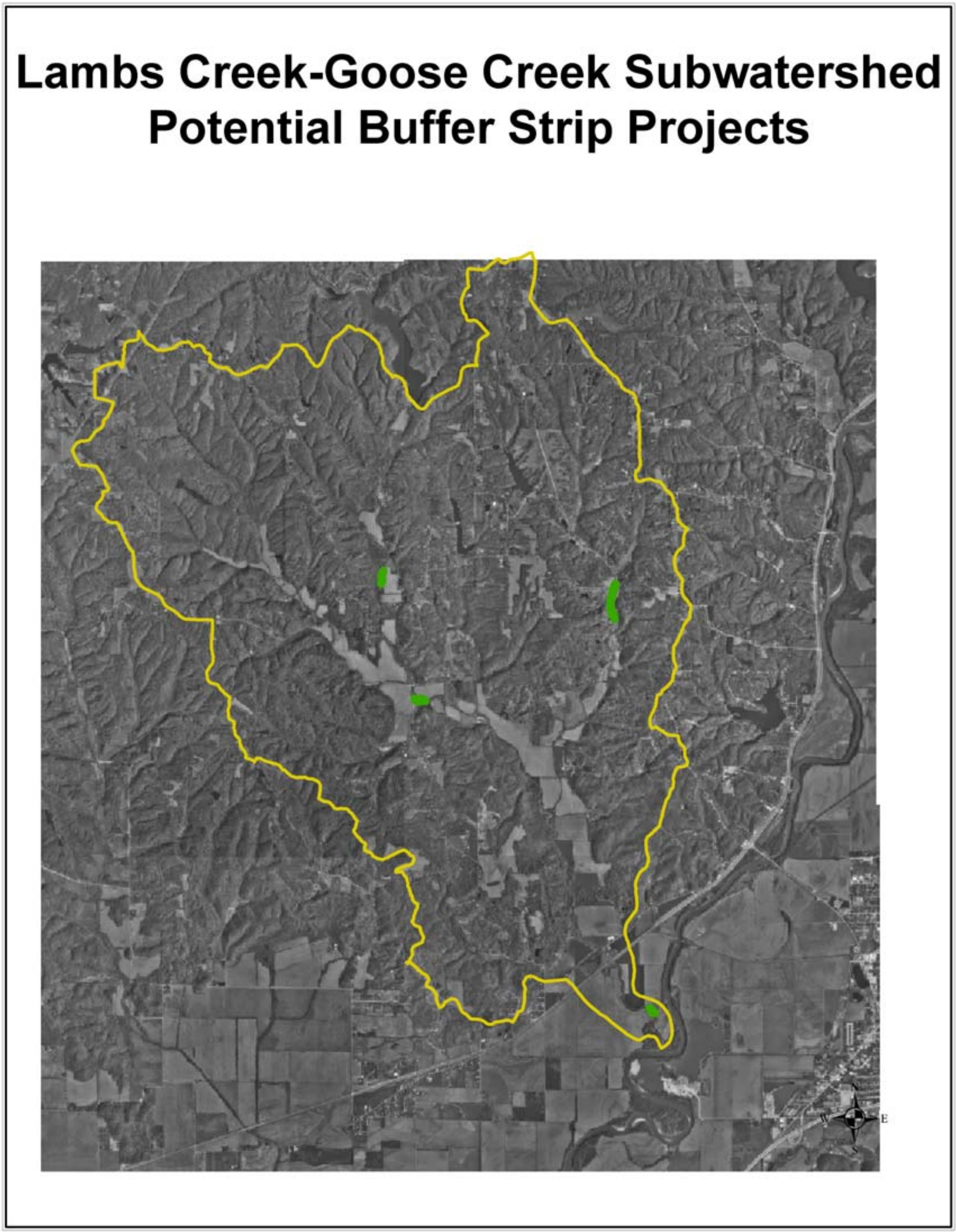


Riparian Buffers in the White River Watershed

The watershed coordination team identified areas adjacent to the White River and its tributaries that, based upon visual assessment of 1998 aerial photography, do not have a vegetated buffer that satisfies the formula in Figure 5-9 (See Figures 5-10 thru 5-15).

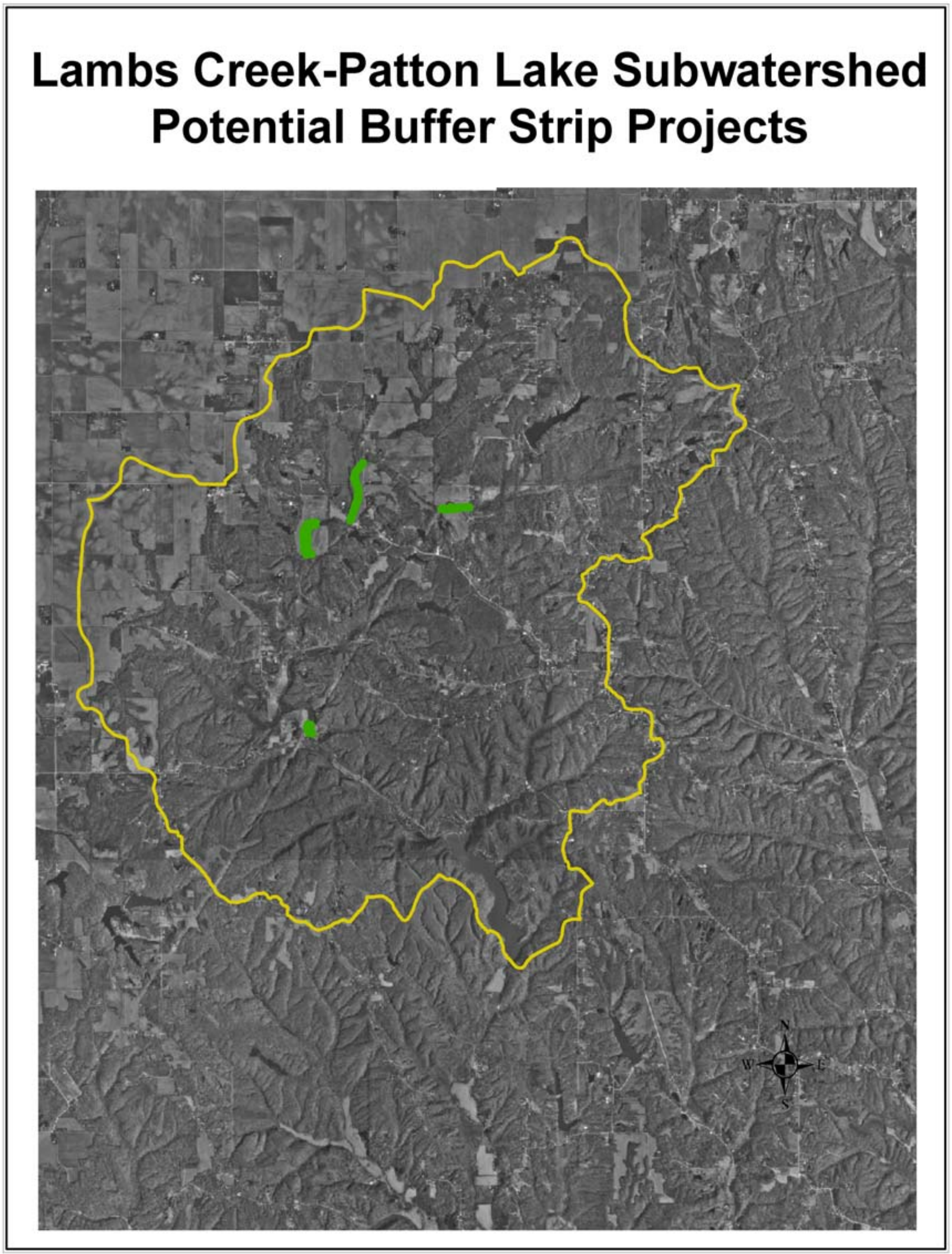
The coordination team recognizes that this information comes with a margin of error due to the scale and the date of the photos. The coordination team feels that this assessment is a good start but recommends actual "ground truthing" by conservation professionals to establish the true needs of the sites identified.

Figure 5.10: Potential Buffer Strip Projects in the Lambs Creek-Goose Creek Subwatershed



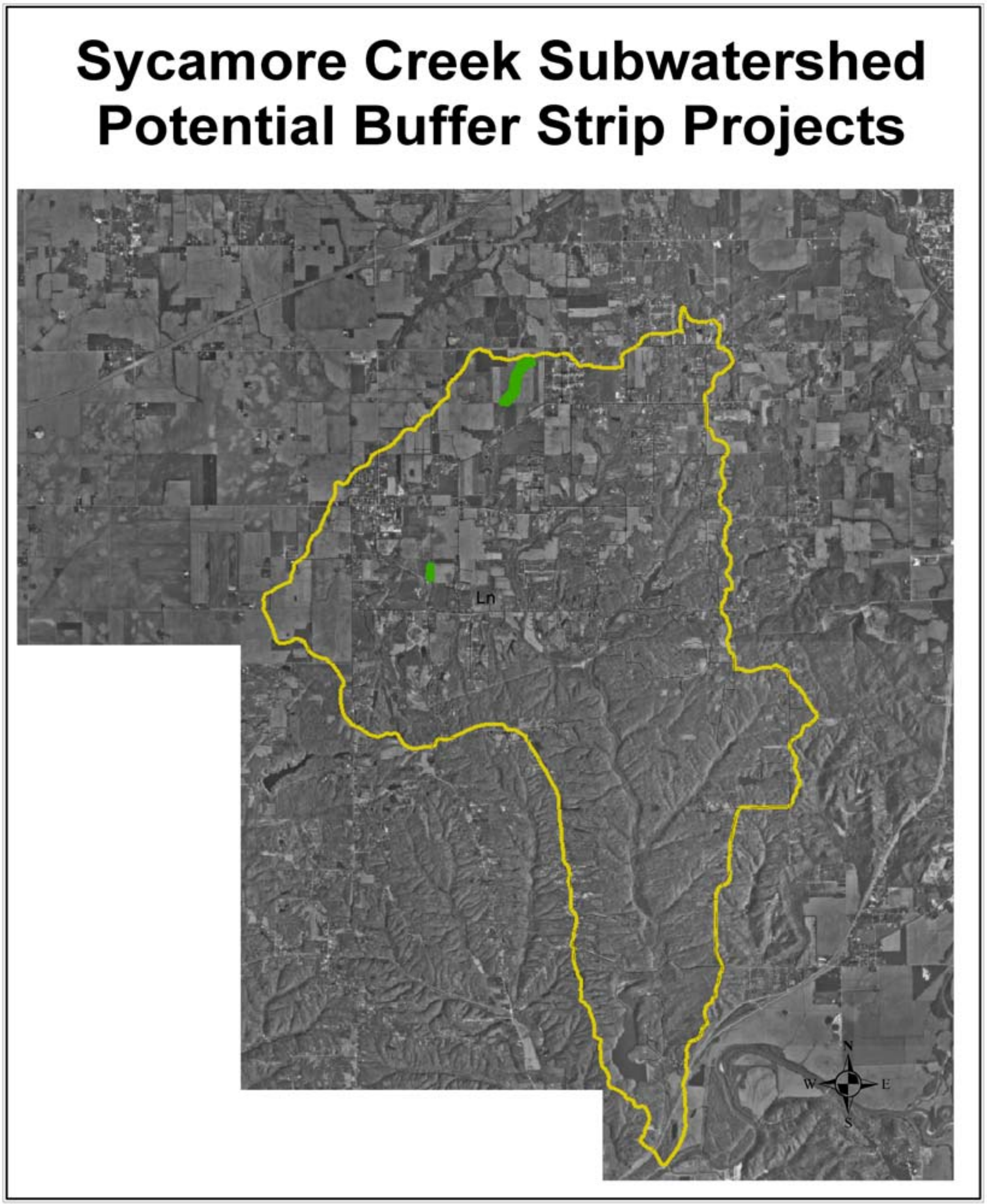
Areas shaded in green indicate areas without adequate buffers. Most, but not all areas lack buffers on both sides of the stream, resulting in 2 segments for each (most) shaded area. Seven (7) segments were identified in the Lambs Creek-Goose Creek totaling 2,789 feet (.52 miles).

Figure 5.11: Potential Buffer Strip Projects in the Lambs Creek-Patton Lake



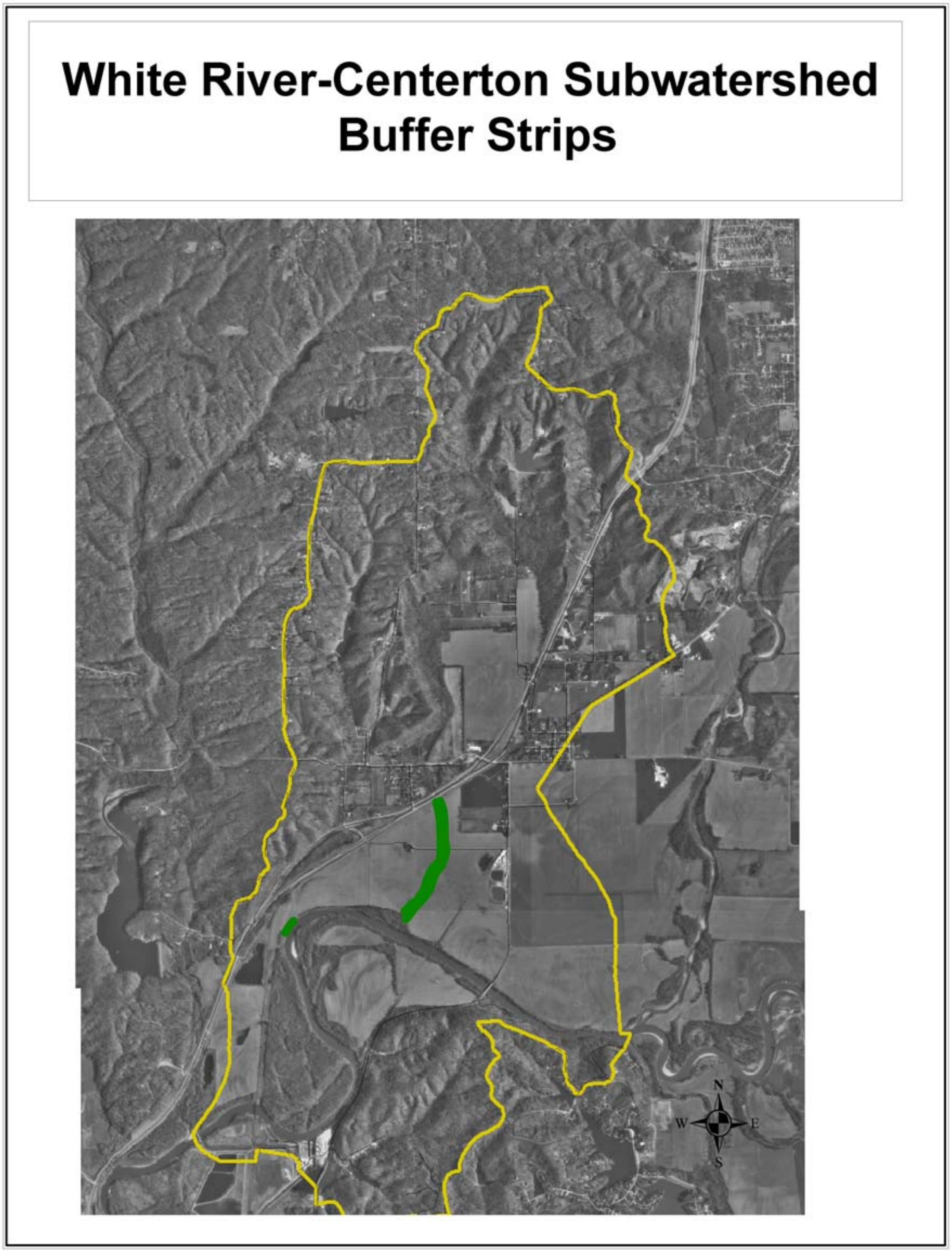
Areas shaded in green indicate areas without adequate buffers. Most, but not all areas lack buffers on both sides of the stream, resulting in 2 segments for each (most) shaded area. Eight (8) segments were identified in the Lambs Creek-Patton Lake subwatershed totaling 6,895 linear feet (1.3 miles).

Figure 5.12: Potential Buffer Strip Projects in the Sycamore Creek



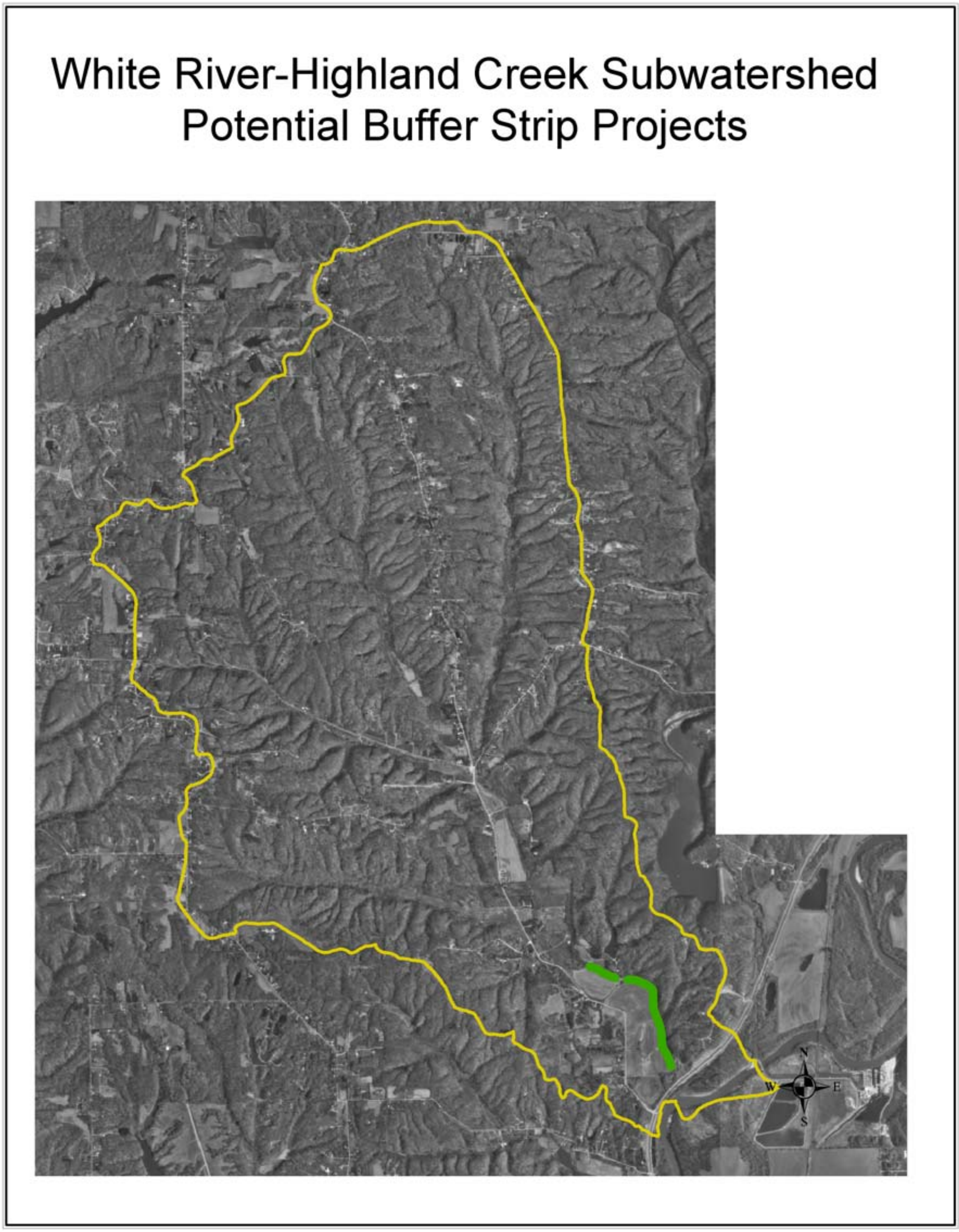
Areas shaded in green indicate areas without adequate buffers. Most, but not all areas lack buffers on both sides of the stream, resulting in 2 segments for each (most) shaded area. Three (3) segments were identified in the Sycamore Creek subwatershed totaling 5,804 linear feet (1.1 miles).

Figure 5.13: Potential Buffer Strip Projects in the Lambs Creek-Goose Creek



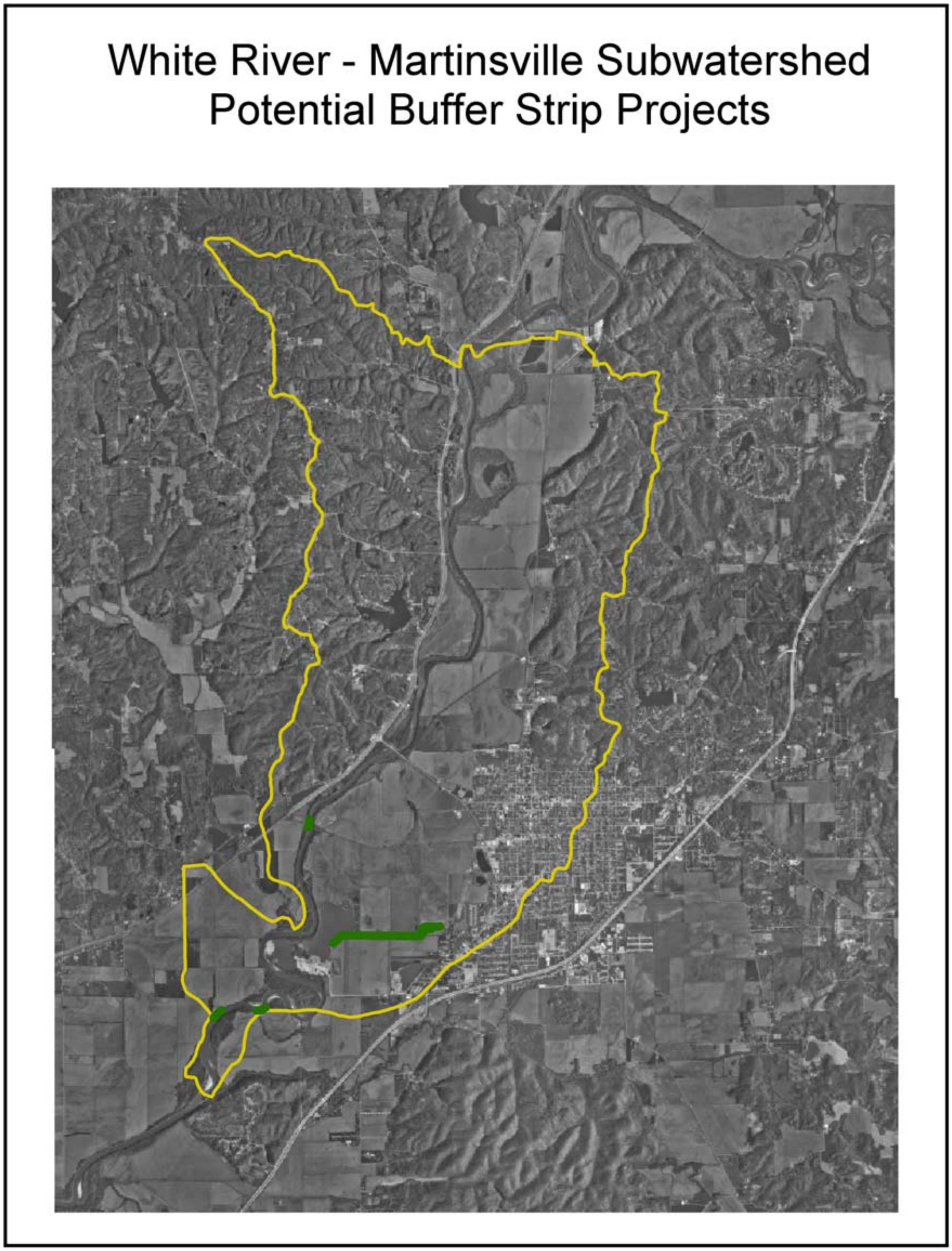
Areas shaded in green indicate areas without adequate buffers. Most, but not all areas lack buffers on both sides of the stream, resulting in 2 segments for each (most) shaded area. Three (3) segments were identified in the White River-Centerton subwatershed totaling 7,300 linear feet (1.4 miles).

Figure 5.14: Potential Buffer Strip Projects in the Highland Creek Subwatershed



Areas shaded in green indicate areas without adequate buffers. Most, but not all areas lack buffers on both sides of the stream, resulting in 2 segments for each (most) shaded area. Two (2) segments were identified in the Lambs Creek-Patton Lake subwatershed totaling 2910 linear feet (.6 miles).

Figure 5.15: Potential Buffer Strip Projects in the White River-Martinsville



Areas shaded in green indicate areas without adequate buffers. Most, but not all areas lack buffers on both sides of the stream, resulting in 2 segments for each (most) shaded area. Six (6) segments were identified in the Lambs Creek-Patton Lake subwatershed totaling 6,822 linear feet (1.3 miles).

Nutrient Management

Nutrient management is another important component to a sound on-farm management system to minimize the impacts that fertilizers have on water quality. According to CTIC there are ten fundamental components of a Crop Nutrient Management Plan. Each component is critical to helping a farmer analyze each field and improve nutrient efficiency for the crops grown. The following components derive from CTIC web site.

1. Field map. For improved planning purposes, field maps should include general reference points such as streams, residences, wellheads, number of acres, soil types, etc.

2. Soil test. Soil tests should be conducted on a consistent schedule to analyze the true nutrient needs of individual fields. Figure 5-16 shows a farmer testing his soils and referencing his sample points utilizing a Global Positioning System (GPS).

3. Crop sequence. The crops grown and the management practices utilized in the past should all be considered when making nutrient management related decisions.

4. Estimated yield. Historic yields are important in developing yield estimates for next year. Accurate yield estimates can dramatically improve nutrient use efficiency.

5. Sources and forms. The sources and forms of available nutrients can vary from farm-to-farm and even field-to-field (manure, legumes, etc.).

6. Sensitive areas. The physical characteristics of the field should be considered when developing a nutrient management plan. One should pay considerable attention to whether or not there are conditions present that could increase or decrease the risk of nutrient loading to water bodies (streams, lakes, drainage ditches, sandy soils, wellheads, buffer strips)

7. Recommended rates. Given everything noted in points 1-6, recommended rates involve the proper amount and location of applied fertilizer.

8. Recommended timing. There are numerous variables involved with the proper timing of fertilizer application (temperature, moisture, tillage practice, whether or not a starter fertilizer will be used, etc.) Taking all variables into consideration will provide a benefit to your nutrient management program.

9. Recommended methods. There are different methods upon which to apply fertilizer and manure. Slope, rainfall patterns, soil type, crop rotation many other factors affect which method is best for optimizing nutrient efficiency. These things should all be considered on a field by field basis.

10. Annual review and update. By keeping good notes throughout the season and annually reviewing the nutrient program can provide great benefit to an operation. Documenting the weather patterns, crop diseases, yields, what fertilizer was applied and how much fertilizer was applied can help a farmer understand how his/her soils respond under different conditions.

Figure 5-16: Soil Testing Utilizing GPS

Pest and Weed Management

As defined by the CTIC, pest management is a comprehensive approach to fine tuning on-farm management of harmful weeds and pests including management strategies that allow for better control, with minimum risk to the environment. Resistant plants, cultural controls, soil amendments, beneficial insects, natural enemies, barriers, physical treatments, behavioral disruptants, biological and conventional pesticides are some of these management strategies.

Figure 5.17: Pest Scouting

Economic and Environmental Benefits of Pesticide Management

Weed and pest management results in fewer herbicide and any other applications, at reduced rates, using the safest and most effective formulations. This minimizes risk associated with the application including accidents, drift, and any potential toxic effects on non-target species. Scouting helps avoid unexpected pest outbreaks, which can cause heavy losses if not caught and treated.

By using mechanical cultivation, pesticides, fertilizers and tillage only when necessary, growers protect the environment, by reducing sediment, and polluted runoff from entering our lakes, streams and rivers. Utilizing scouting and selecting the appropriate control for the weed or pest identified, supports the biological integrity of all life on earth.

5.2.1 Prioritization

Taking all of the above information into consideration, the technical and land use committees developed the following priorities for row crop management.

1. Farms not currently utilizing conservation tillage, conservation buffers, nutrient management and pest management
2. Farms containing highly erodible soils (see Figure 5-2)
3. Areas within the watershed that have been identified as having water quality impairments associated with row crop production (see Appendix B).
4. Stream corridors identified by the watershed coordination team as not having sufficient vegetated buffers (see Figures 5-x-5-z)

5.2.2 Goals for Improvement and Protection

Primary Goal #4 of this Watershed Management Plan, as outlined in Section 1 of this document, is "to the greatest extent possible and with existing and potential resources, improve and protect water quality in the watershed with the intention, where applicable and appropriate, to achieve and maintain state water quality standards." In order to achieve Primary Goal #4 of this Watershed Management Plan, the following objectives related to row crop issues have been established:

<u>Objective #5-1</u>: By 2006, attempt interaction with 100% of the row crop producers in the watershed to stress the economic and environmental benefits of adopting conservation practices such as conservation tillage, conservation buffers, nutrient management and pest management as well as other conservation practices and to provide the necessary technical and financial assistance to implement those practices.

<u>Objective #5-2</u>: By 2006, increase conservation tillage by 10% throughout the watershed.

- Soybean Acres—87% to 97% by 2006 (512 acres)

- Corn Acres—21% to 31% by 2006 (562 acres)

Objective #5-3: By 2006, install buffers along 30% of the stream corridors identified as lacking buffers (9,756 feet of the 32,520 identified)

Management Measures:
Achieving the goals set by the Watershed Initiative for water quality protection through agricultural conservation practices will involve ongoing and never-ending processes, programs, and actions. In order to achieve the three (3) objectives at protecting water quality through agricultural conservation, the Soil and Water Conservation District will implement several interrelated programs.

- Heavily "market" best management practices and cost-share programs such as the Conservation Reserve Program (CRP), Environmental Quality Incentive Program (EQIP), IDEM Section 319 cost-share dollars, throughout the watershed but specifically targeted to priority areas identified in the Prioritization section of this plan.
- Provide technical and financial assistance to landowners and farmers regarding agricultural best management practices and the funds available for such practices

5.2.3 Loads or Contributions for the Management Measures

The IDEM's Load Reduction Workbook was utilized to calculate/estimate the pollutant load reductions associated with achieving Objectives 5-2 and 5-3. The Load Reduction Workbook uses the "Pollutants Controlled Calculation and Documentation for Section 319 Watershed Training Manual (Michigan Department of Environmental Quality, June 1999) to provide a gross estimate of sediment and nutrient load reductions associated with the implementation of agricultural conservation practices. This workbook uses many simplifying assumptions to provide a general ESTIMATE of pollutant load reductions (IDEM, 2003).

- Estimated Load Reductions for Objective 5-2 are as follows:

Sediment Load Reduction: 413 ton/year
Phosphorus Load Reduction: 693 lbs/year
Nitrogen Load Reduction: 1383 lbs/year

- Estimated Load Reductions for Objective 5-3 are as follows:

Sediment Load Reduction: 18 tons/year
Phosphorus Load Reduction: 53 lbs/year
Nitrogen Load Reduction: 98 lbs/year

5.2.4 Action Plan

Actions Necessary to Achieve Objectives #1, #2, and #3:

Action 5-1: Hire an individual at the SWCD to "market" conservation programs to farmers within the watershed.

Action 5-2: Through the hired individual, contact and interact with 100% of the farmers within the watershed regarding the economic and water quality benefits that stem from proper management of fertilizers, pesticides, and soils.

Action 5-3: Provide technical assistance to landowners and farmers regarding agricultural conservation best management practices.

Action 5-4: Provide guidance to landowners and farmers regarding public and private conservation programs such as IDEM/EPA cost-share programs (Section 319), USDA cost-share programs (EQIP, CRP, etc.), etc.

Action 5-5: Organize and conduct a series of field days and workshops for local landowners and farmers covering topics such as conservation tillage, conservation buffers, nutrient management, pest management, farm*a*syst, etc.

5.2.5 Resources

The Morgan County SWCD, IDNR, and NRCS staff members have been identified as the key resources to improve agricultural practices within the Morgan County White River watershed. Together, these agencies will work together to educate landowners and farmers of the economic and environmental benefits of implementing conservation practices upon agricultural lands. These agencies will also be responsible for providing technical and financial assistance to landowners and producers to support the implementation of best management practices.

5.2.6 Legal Matters:

Legal matters are not applicable to this section.

5.3 MEASURING PROGRESS

In order to measure the progress of the actions outlined in this section, the SWCD will have to do the following:

- Document all interaction with local farmers
- Document the attendance at field days and workshops
- Utilizing GIS, document the location and other specifics of projects implemented as a result of this project.
- If applicable, load reductions will be calculated for individual projects implemented within the watershed utilizing the IDEM's Load Reduction Workbook.

5.3.1 Indicators Selected to Determine Progress

Indicators selected to determine the progress with plan implementation include:

- Conservation practices implemented or installed.
- Public surveys.
- Attendance at conferences, workshops, and field days.
- Overall water quality improvements.
- Farmers and landowners reached through outreach efforts.
- Pollutant load reductions reached through the implementation of conservation practices.

5.3.2 Monitoring Indicators

Indicators of success will include a series of activities:

- Documenting, in GIS, the implementation of best management practices funded and implemented through USDA, IDNR, and IDEM cost-share funds.
- Utilizing the IDEM's Load Reduction Workbook (where applicable) for best management practices implemented to estimate sediment and nutrient load reductions.
- Documenting the number of participants at agricultural field days and workshops.
- Documenting frequency and number of producers reached through outreach efforts.
- Conducting surveys among local farmers to obtain their level of knowledge of and willingness to participate in conservation activities.
- Water quality improvements.

5.3.3 Operation and Maintenance

The landowners who participate in government cost-share programs are ultimately responsible for the operation and maintenance of practices installed with those funds. IDEM and USDA programs typically require that the landowner sign a 10-15 year maintenance agreement with their cost-share application.

5.3.4 Re-Evaluation of Plan

The SWCD will be responsible for the re-evaluation of this plan. Such activities will occur on an annual basis to evaluate the progress and determine if any changes are necessary to the strategies originally devised.